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IN THIS ISSUE

REGULAR FEATURES

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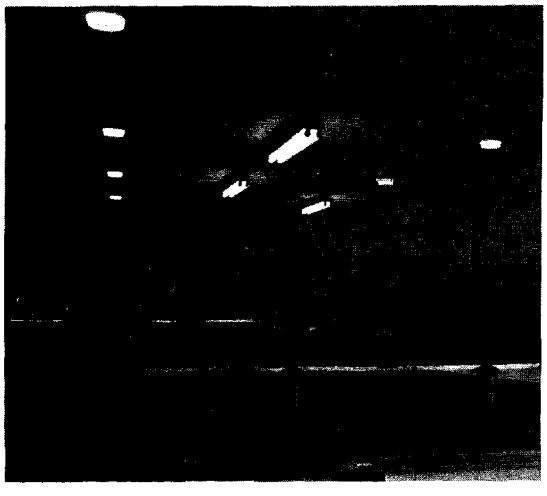
FRONT AND BACK COVERS

Bill Jack Rodgers' cover photo is of quartz tube heated and bent to form a helical, toroidal shape. More photos of LASL's new quartz tube forming machine begin on Page 16. Bill Jack's picture of overhead light reflections in a window illustrates only reflections, or does it? See back cover.



Transporting the giant loads required by many LASL programs is one of the more demanding tasks of SP-4, the shipping, receiving, and warehousing group. Much of SP-4's work load consists of handling the Laboratory's routine shipments of equipment and supplies. Oversized burdens like these tower sections, however, present dangers that can be coped with only by personnel like Jimmy Romero who have special knowledge and skills.

LASL's Trucking Company

By JOHNNIE MARTINEZ

Not more than a few hundred yards from where LASL researchers are unlocking the secrets of nuclear energy, a member of the Laboratory's shipping, receiving, and warehousing group (SP-4), is climbing into the cab of a 5-ton truck and unleashing a different sort of power—diesel power.

The energy released by the noisy engine beneath the truckdriver is almost insignificant compared to a silent nuclear power plant, but the thunder of a starting diesel is most impressive, and the slow, heavy rhythm the engine produces while idling sounds hypnotically powerful.

While the massive engine warms up, the driver will scan the many gauges and dials that reveal the expensive engine's heartbeat. Then he'll carefully shift the 16-speed

transmission into a low gear and guide the growling truck out of the freight yard. Its destination? Perhaps it's going to Albuquerque, where several tons of supplies are being crated for shipment to Los Alamos—or to one of the Laboratory's many technical sites and research areas. The truck may be carrying precious optical equipment, hundreds of feet of coaxial cable, or carefully packed and sealed radioactive materials.

Whatever the cargo, it will be packaged, loaded, and delivered safely by the expert truckdrivers and freight-handlers of SP-4, a group that could just as easily be called the "LASL Trucking Company." They have the responsibility of maintaining an over-the-road freight shuttle of equipment and materials to and from the Laboratory. And, considering the size and scope of the job, they do it with almost amazing efficiency.

At SP-4's headquarters in the Laboratory's main warehouse complex, nearly 60,000 shipments a year come in and 7,000 are sent out to the tune of roaring semitrailer trucks, rattling forklift units scuttling about like ants, and voices of the men and women who staff the warehouse.

The din and clatter of the warehouse and freight yard aren't conducive to serious thought and scientific study, but there's probably no better indication of the Laboratory's liveliness than this noisy pulse beat.

Monkeys on their way to Health Division installations, "hot boxes" being transported to the new plutonium handling facility, steel shielding to LAMPF, crates of expensive scientific apparatus to the Laser Division, and the often dangerous chemicals needed by LASL experimenters all must be received, inspected, and delivered by LASL's "trucking company."

With 50 highly trained men and women and about 50 pieces of equipment at their disposal, SP-4 Group Leader William Heinze and his alternate, Jesus Martinez, take quiet pride in the group's giant task and the expertise required to accomplish it.

The 2 men have a combined total of nearly 60 years with the Labora-

Jose "Tony" Trujillo is one of SP-4's 8 semitrailer truckdrivers. Last summer, Tony entered 5-axle truck competition in the New Mexico State Truck Safety Roadeo in Albuquerque. After passing a written examination of 100 questions, an oral interview, vehicle safety inspection, and a driving test, Tony captured the first place trophy.

No matter how unusual or how big the load, SP-4 has the expertise to handle it. The group's truck-drivers' and freight handlers' knowledge must go beyond the usual information used by commercial truckers and include procedures for handling radioactive materials and other unusual commodities.

A good part of a truckdriver's time, as Tobias Vigil could tell you, is spent waiting. Some of the unusual shipments handled by SP-4 at the Laboratory call for special care in loading, transporting, and unloading—care that consumes a good deal of time but is a necessity for safety and security reasons.

tory, and their recollections of freight hauling for LASL go back to the very early days when 2 tandem-axled, military wreckers with the unlikely names of "Calamity Jane" and "Brooklyn Betsy" were all the Laboratory had to load and unload almost every piece of equipment and bit of material that arrived.

"Brooklyn Betsy's" now historic function on "The Hill" included loading the first atomic bombs on trucks for the first leg of the weapons' journey to Japan. There's also the time a worker drove "Betsy's" boom through 2 telephone poles and cut off telephone service to White Rock for 2 days.

"Calamity Jane" was loaned to another installation shortly after the war; "Betsy" was retired with honors in 1960; but an even bigger job remained in meeting the transportation needs of an ever-growing laboratory. That job, according to Heinze, has called not only for the most up-to-date equipment available but for highly trained and reliable personnel like Jose "Tony" Trujillo.

Tony is one of SP-4's 8 semi-trailer truck drivers. These are the people behind the wheels of the giant diesel-powered trucks that can be seen around the Laboratory pulling anything from tank-trailer loads of nitrogen to massive slabs of concrete shielding.

Truck drivers are more than delivery boys.

Keeping an 8-foot-wide, 5-axled, 20- to 30-ton vehicle under complete control on the open highway calls for a cool mind and a very steady hand, even during optimum driving conditions. Placing an even wider, sometimes heavier, load on that same monstrous truck and guiding it up over the Jemez Mountains on the twisted road to the Laboratory's Fenton Hill geothermal site demands that a driver possess an almost mystic ability to see around, behind, and under his vehicle. It can be an unsettling and downright dangerous experience for anyone accustomed to driving a passenger car with 4-way visibility.

But Tony can handle a truck so well that last summer he won a prize for his abilities in the New Mexico State Truck Safety Roadeo in Albuquerque. The Roadeo is an annual contest sponsored by the New Mexico Motor Carriers Association and attracts entries from throughout the state.

Tony entered the 5-axle class of competition and was awarded the first place trophy after missing only 3 questions out of a 100-question exam, passing an oral interview, completing a vehicle safety inspection, and skillfully maneuvering a semitrailer truck during a driving test. The Roadeo scoring system is based on safety in both driving and the handling of hazardous materials—areas in which Tony and his fellow drivers are particularly well versed.

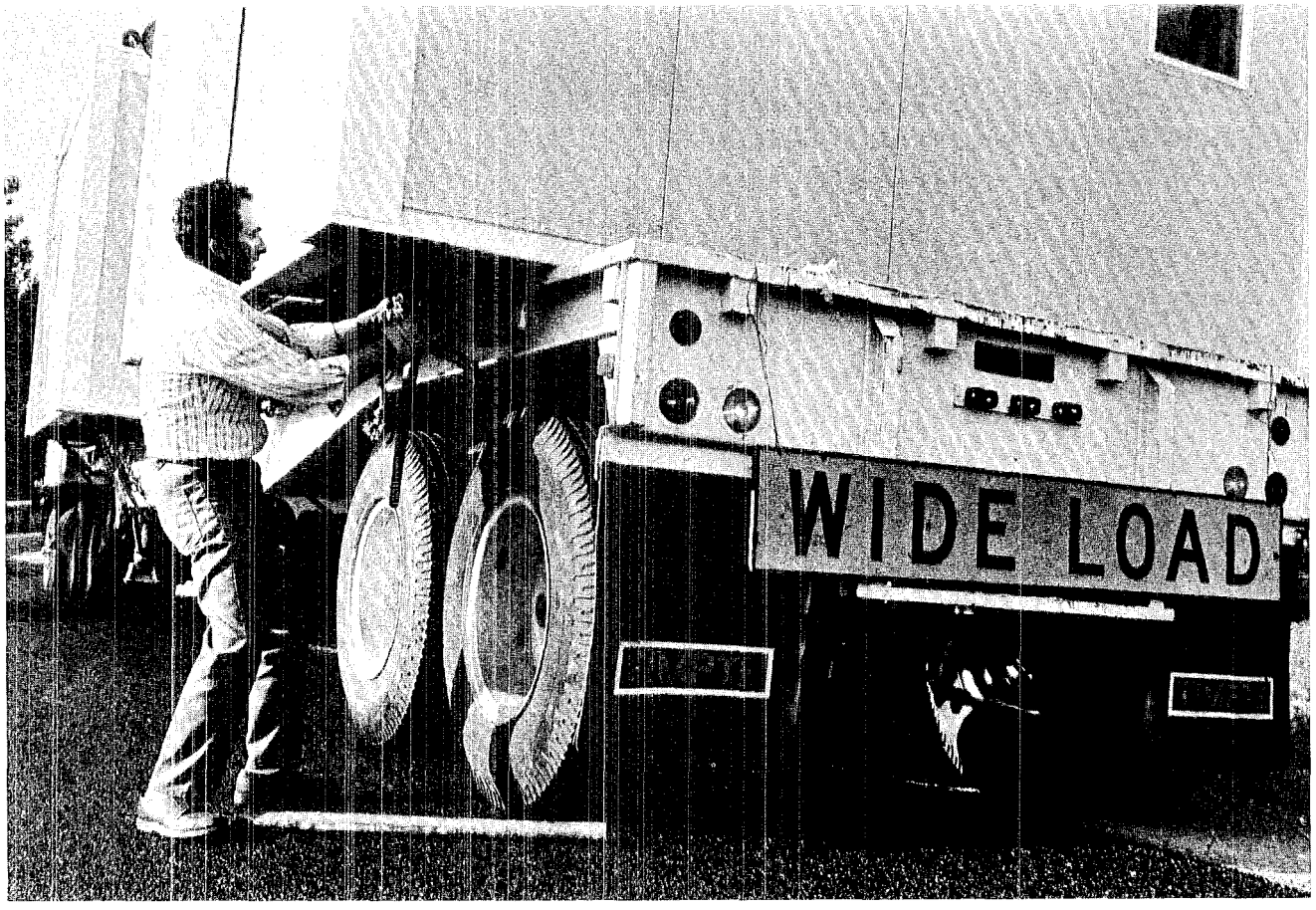
The SP-4 semitrailer and 9 "straight" (nontrailer) truckdrivers also transport the high explosives, radioactive materials, corrosive chemicals, and other hazardous items needed at the Laboratory's various research sites. Handling these items safely places further demands on the SP-4 truckdrivers and freight handlers and is the reason for a continuous and ever-growing training program for the group.

According to Heinze, his employees must be familiar not only with the conventional Department of Transportation, State of New Mexico, Energy Research and Development Administration, and LASL rules and regulations concerning the transportation of freight, but must take special care to be informed about some of the freight problems peculiar to a nuclear weapons research institution. Accomplishing this calls for special safety training programs that are as current as SP-4 and the Laboratory's Health Research Division can make them.

All of SP-4's employees are given training in the safe handling of common as well as radioactive materials. This includes audio-visual presentations on what radiation and radioactive materials are and how these materials can be properly packaged, checked, recorded, and transported.

Certain hazardous materials are prohibited by law from being transported in combinations aboard the same truck; special labels and packages must indicate the materials'

SP-4's truckdrivers must "know their ropes" at least as well as sailors. Securing oversize loads for safe transportation calls for experienced hands like Romero's. Jimmy's load of tower sections is bound for the Fenton Hill geothermal research site. The road to the site is a twisted one, and special care must be taken to make sure the load is securely attached to the truck.



presence aboard the vehicle; and an additional set of operating regulations regarding such things as speed and parking procedures apply.

The mishandling of dangerous materials can, by law, be made the personal liability of the employee, Heinze says. And the worker who improperly packages or delivers a dangerous item could be cited and fined for his mistake.

Considering the volume of work the SP-4 people are engaged in, mistakes don't happen very often and the ones that do usually consist of the occasional problems experienced by anyone in the trucking business who must handle hundreds of freight arrivals and deliveries every day.

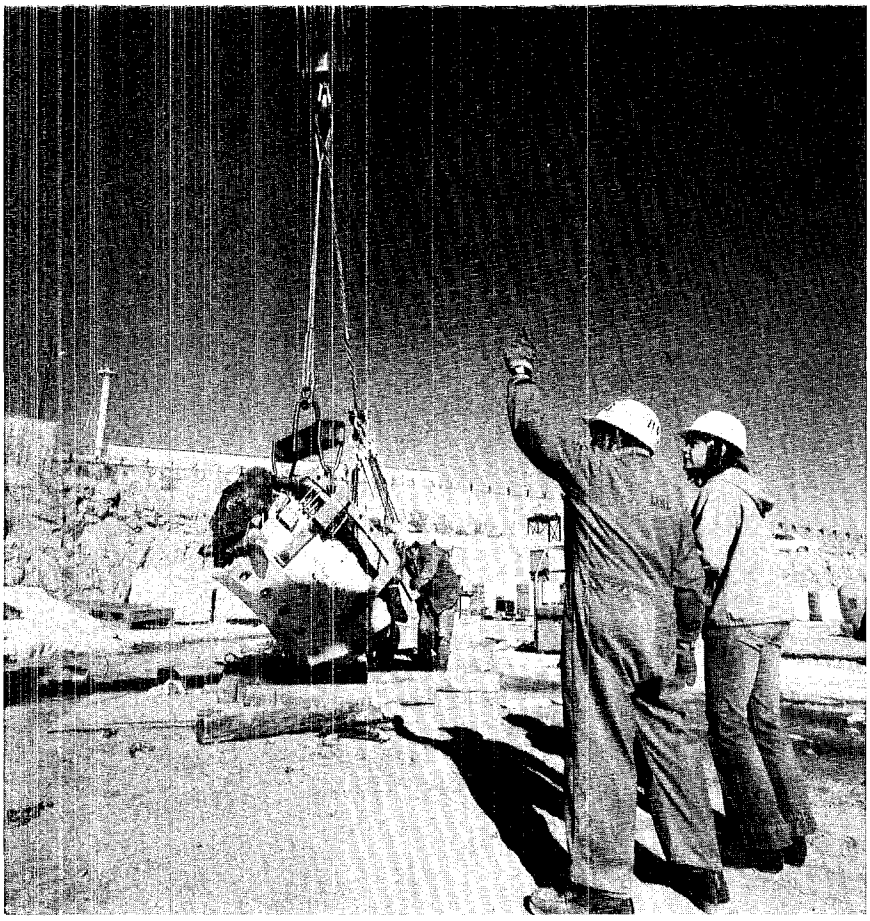
A few of these problems have been humorous. The various animals the Laboratory needs for different programs present transportation difficulties quite different from those normally encountered by the SP-4 truckdrivers. More than once members of the group have found themselves chasing rats or rabbits that managed to escape from their shipping crates.

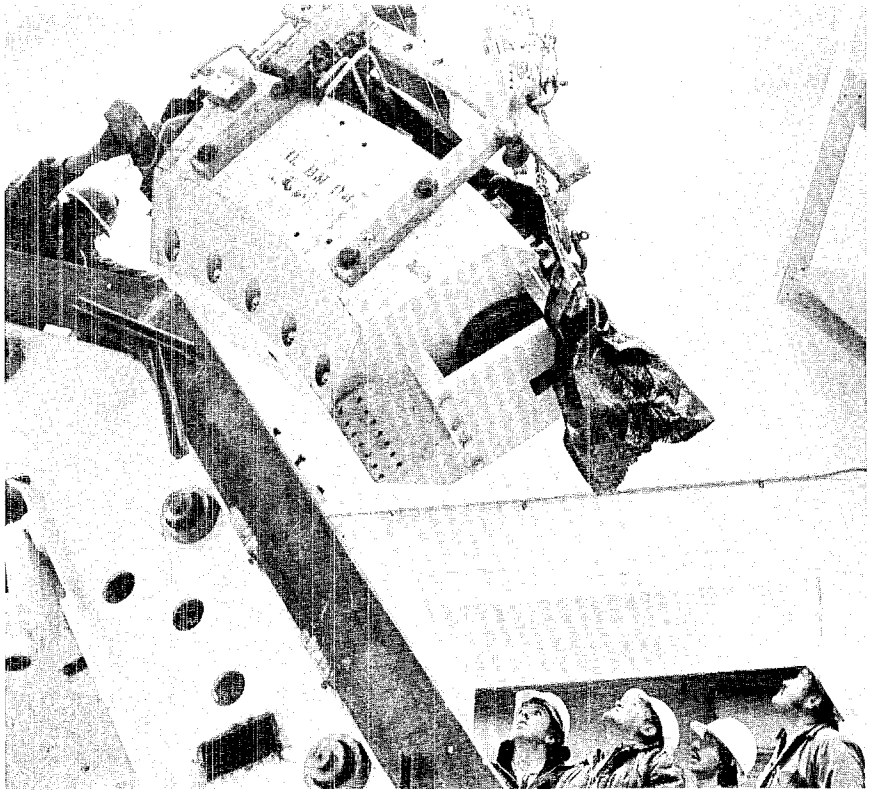
During Fiscal Year 1976, SP-4 received 57,793 shipments and sent 6,743. Those figures amounted to a total of 11,346 tons of chemicals, equipment, materials, and supplies of all kinds that were received, recorded, and distributed by the group. The view of SP-4's shipping and receiving area in the main warehouse complex gives some idea of the volume of work required in meeting the Laboratory's freight needs.

At other times, getting a shipment to its destination has called for more than the usual expertise gained by hauling heavy freight. One of these occasions was encountered some years ago with the arrival at the Santa Fe airport of 12 mules from Oak Ridge, Tennessee. The mules were part of a two-and-a-half-week participation in a biomedical research program of radiation measurements and effects at Los Alamos and represented a "first" for the "LASL Trucking Company." The animals were safely transported to the Laboratory and back to the airport for a return trip to Tennessee.

And so, whether it's high explosive or monkeys, ball-point pens or nitrogen, SP-4 has the people and the equipment to handle the load safely and efficiently. As Bill Heinze proudly says of his group, "We're more than just delivery boys."

Photo Shorts





Zia and LASL workers supervise the lifting, above, and the lowering into place, right, of a magnet at the Laboratory's new Weapons Neutron Research (WNR) Facility. The facility will receive particle beams diverted from the beam line at LAMPF.

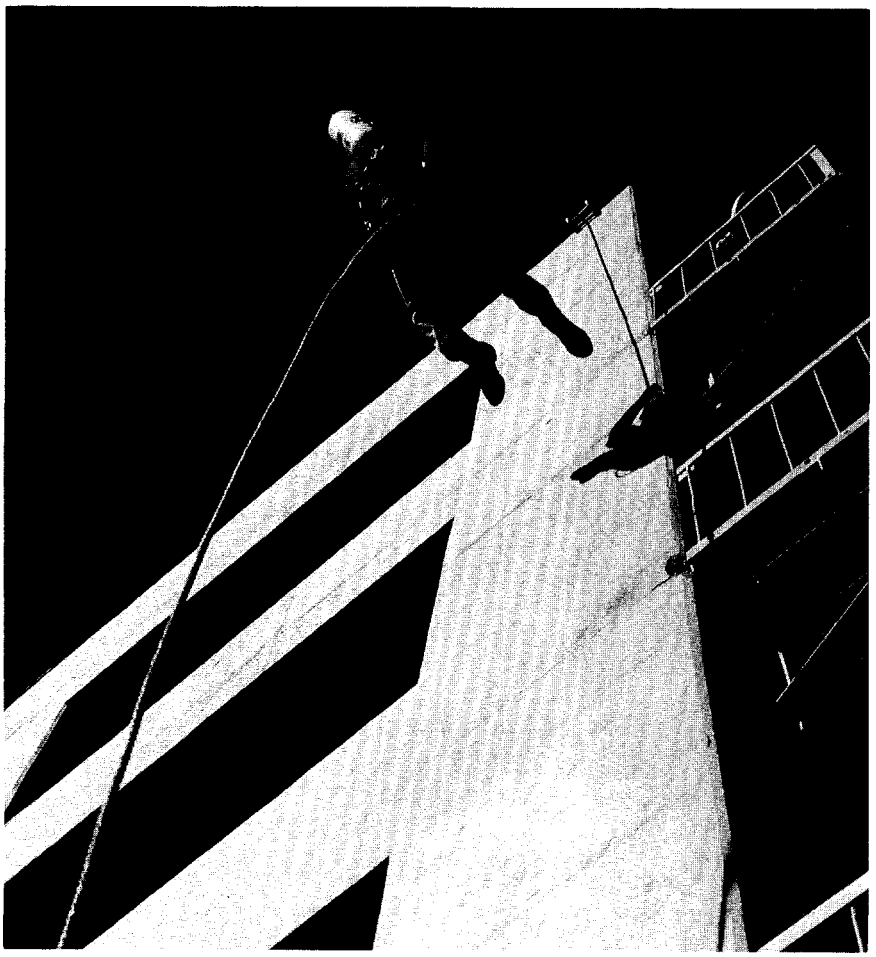
Firefighters, H-5 Researchers Test Harnesses

The Respirator Research and Development Section (RRDS) of H-5, in conducting part of a study to determine the physiological effects on the users of self-contained breathing apparatus (SCBA), has been enlisting the aid of ERDA firefighters to test the SCBA backpacks.

Five commercially available 30-minute backpacks were compared for comfort and safety. Both men and women tested the backpacks, with full tanks, for comfort during a series of exercises that simulated real-life situations for the firefighters.

Tom Davis, H-5 researcher, supervised testing and recorded comments from the men and women. The persons involved in the testing agreed that none of the 5 commercial backpacks was entirely satisfactory.

Davis has recommended that the RRDS purchase a good camping backpack frame, with padded harness straps, and have it modified to hold a 30-minute air tank. The apparatus would be tested by ERDA firefighters and RRDS until specific recommendations on SCBA harness design can be made.



ERDA firefighters test self-contained breathing apparatus backpacks in two exercises, climbing ladders and descending by rope, common to the firefighters. The tests were conducted at the ERDA fire practice tower on DP Road.

Captain James Trehern, left, and firemen Juanito Martinez, John Campos, Rudy Martinez, and Frank Sanchez, talk to Tom Davis, H-5, right, after conclusion of part of a series of tests of the self-contained breathing apparatus backpacks in the top photo. At right, 2 of the firemen attempt to remove the breathing apparatus backpack from Trehern in a simulated emergency.

ELA Program Near Completion

Rapid Screening For Diseases

By BARB MULKIN

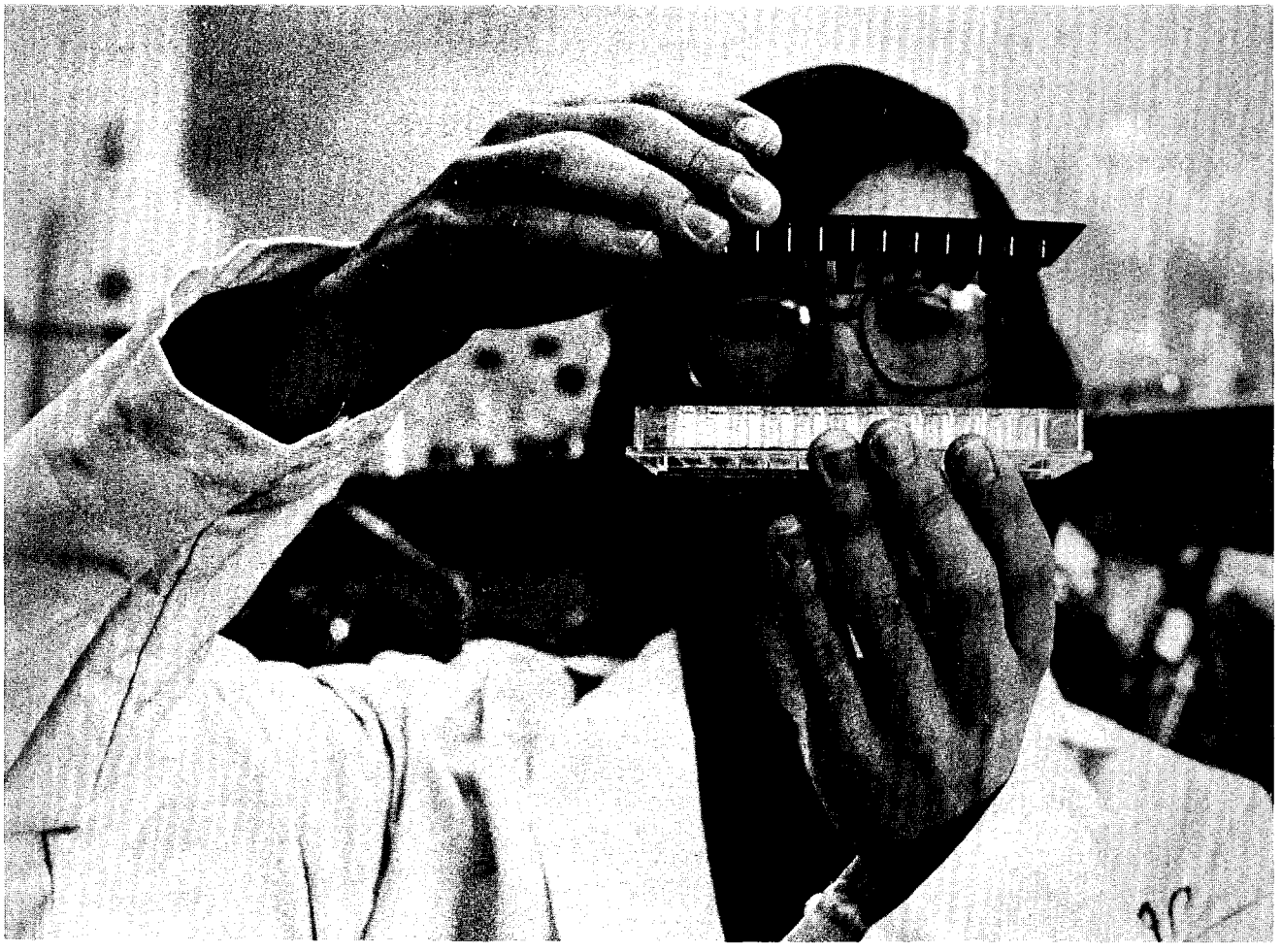
"Forewarned is forearmed" might be the motto of a group of LASL scientists whose work involves development of disease detection systems that have potential benefits for both animals and man. These scientists, George Saunders, Elva Clinard, Mary Louise Bartlett, Mort Sanders, Bob Payne, and Elmo Martinez, all H-6, are completing a long-term project resulting in an automated system for rapid screening for multiple animal diseases that are potentially harmful to man.

Saunders, a doctor of veterinary medicine with postgraduate experience in immunology, says that the system, the Enzyme-Labeled Antibody test (ELA), appears to meet the qualifications for a simple, universal antibody disease detection system that is fast, accurate, inexpensive, and adaptable to a variety of test conditions.

Development of the ELA test was funded largely by the United States Department of Agriculture (USDA) and in part by the United States Public Health Service (USPHS). It is 1 of 2 serological tests initially investigated at LASL through a USDA-AEC (now ERDA) agreement for early detection of trichinosis in hogs.

The United States does not have a program for controlling this para-

Elmo Martinez, H-6, demonstrates testing of multiple samples of suspect material from animals. Antibodies will form in the test trays that contain disease agents if the specific disease is present.



sitic disease, and, although it can be transmitted to humans through undercooked pork, it is not considered a major public health hazard. However, trichinosis has economic impact on U.S. pork producers, since countries that are free of the disease will not buy uncooked American pork.

Trichinosis is the first disease successfully detected with the ELA system, and the potential for using the simple, 4-step, 30-minute procedure for other diseases was obvious, according to Saunders.

"The ELA system has since proven effective in detecting hog cholera (a viral disease) and bovine brucellosis (a bacterial disease that can cause undulant fever in humans) and, most recently, staphylococcus enterotoxin (the most common cause of food poisoning)," Saunders reports.

Other diseases that have been detected with preliminary success include bovine viral diarrhea in cattle and swine, tuberculosis, beef tape worm, and a variety of animal blood disorders.

"The ELA test will also prove useful in tracing drug residues in animals," Saunders believes.

"It is against the law to slaughter animals without waiting for a stipulated time for drugs to clear the animal's system," he points out. "Otherwise, persons allergic to such drugs as penicillin or sulfa could suffer adverse reactions after eating the meat."

Another potential danger for humans is consumption of meat from animals fed estrogen to promote rapid weight gain. Such drugs have been linked to cancer.

Saunders describes the ELA serological test as being based on the detection of antibodies that an animal, or human, produces to combat foreign agents (disease antigens) that invade the body. Antibodies discriminate- each type of antibody is effective only against a specific disease antigen, and, indeed, an antibody is only formed when an antigen appears on the scene.

In a typical ELA test, antigen for a specific disease is added to the test wells of plastic trays. In essence, the antigen is bound to the surface of the test well. A drop or 2 of each animal's serum or whole blood is added to separate wells and the tray is incubated. A reagent that will adhere to an antigen-antibody complex is tagged with an enzyme and added to the test wells. A third reagent that will chemically interact with the enzyme, and in doing so change color, is added. The sample liquid is then ready for testing.

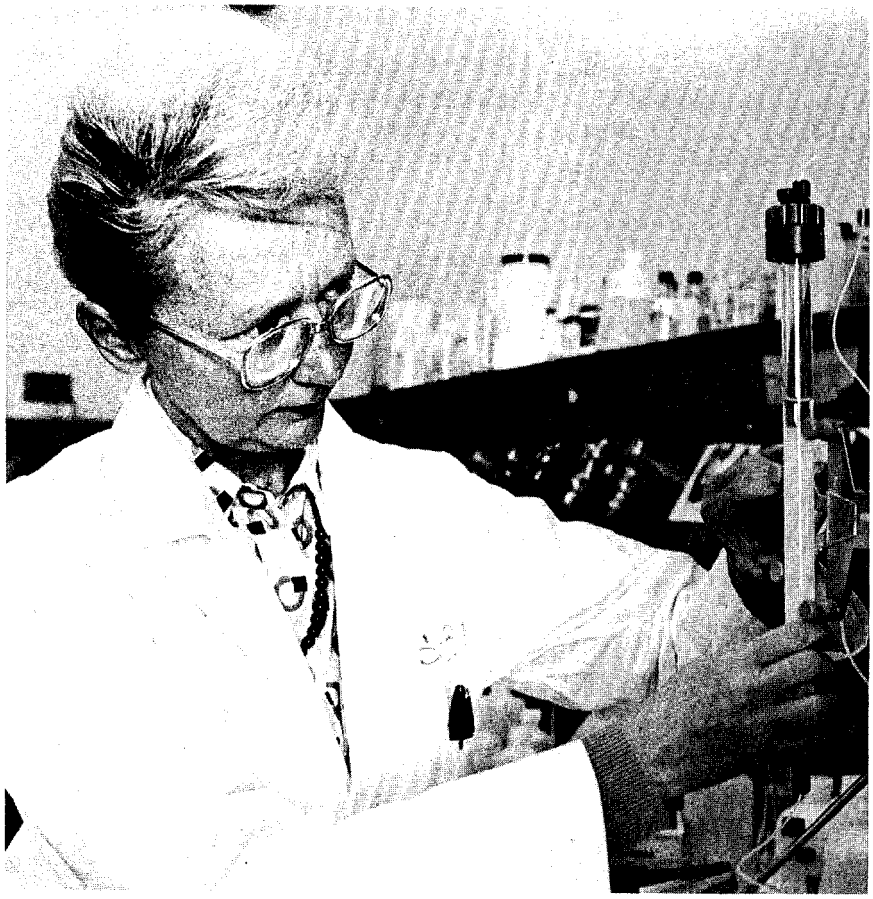
Martinez adds a chemical reagent to samples in a test tray to demonstrate the simplicity of the system as George Saunders, principal investigator in the project, which resulted in an inexpensive, 4-step system for detecting disease in animals, observes. The system can confirm or deny the presence of many diseases such as trichinosis and brucellosis.

A spectrophotometer (an instrument that measures the intensity of light of various wavelengths) is used to convert light intensity to an electrical voltage, which is recorded digitally, that is, as a number. By establishing threshold levels of color intensity for various diseases, researchers can tell whether antibodies to disease are present in the sample.

In multiple screening, 2 or more antigens are bound in the same test wells of the trays. If the reading is positive, researchers know that at least one of the diseases is present. The original sample would then be retrieved and tested for the specific disease.

Saunders points out that one of the most important aspects of the ELA system is its extreme versatility. "Only minor changes would be necessary to adapt the system to test for different diseases in man or in various animals," he says. "Typically this might involve merely using a different reagent."

The effectiveness of the ELA test was proven in 1976 during an outbreak of hog cholera in New Jersey. Saunders says it was the first time LASL researchers had a chance to take the system into the field and obtain direct results comparing the test with the standard, accurate, but more expensive and time-consuming serum neutralization test then in use.



In the top photo, Mary Louise Bartlett, H-6, prepares a sample for detection of disease, and, right, Elva Clinard, one of the principal investigators who developed the Enzyme-Labeled Antibody (ELA) test, works with animal sera.

The ELA Test Uses No Radioactive Isotopes

"The required laboratory supplies fitted into just 2 suitcases, and I was able to begin performing tests for hog cholera within 2 hours of arriving at the task force laboratory in Trenton, New Jersey," he recalls. "Additional antigen trays were prepared at LASL and shipped to Trenton. They arrived within 18 hours, and I had enough material to eventually process 2,000 field samples."

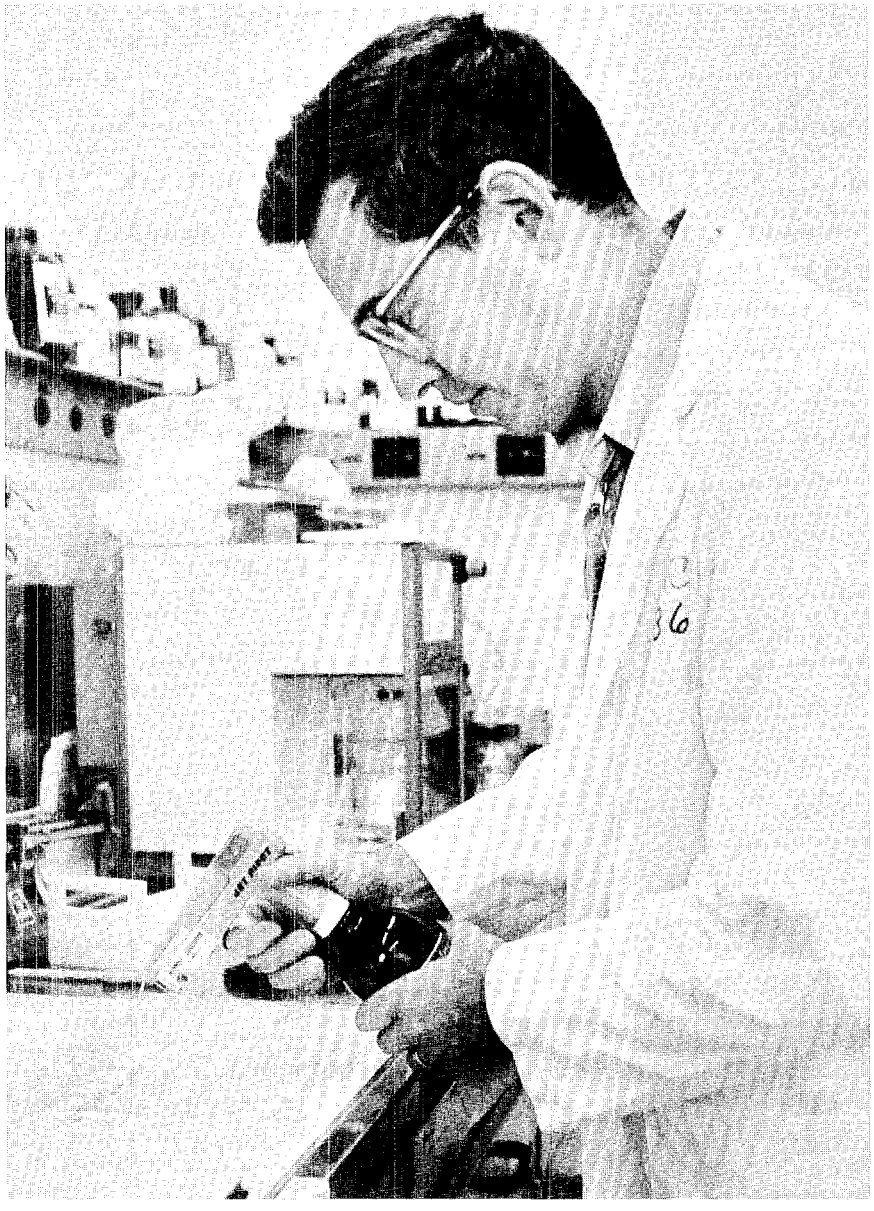
During the New Jersey hog cholera outbreak, Saunders was able to process the same number of samples in 1 day as 3 persons using the serum neutralization (SN) test. This was because the SN test requires approximately 18 hours to deliver results while the ELA test took only about 1 hour (since cut to 30 minutes with automation).

"The results of this field experiment and the extensive laboratory research in which we used control (uncontaminated) samples indicate that ELA is the better choice for screening for hog cholera," Saunders concludes.

He points out that diseases of domestic animals adversely affect both global economies and the food quality of all of the countries in the world.

"Control and containment of disease depends to a large degree on rapid diagnosis coupled with adequate knowledge of the recent movement of infected animals," he says.

There is presently a diverse array of immunological tests used to aid in diagnosis of disease, but many of them must be performed by highly trained personnel in well-equipped laboratories -- requirements that are not compatible with rapid diagnosis and containment.



Saunders prepares to test samples of serum to obtain a digital readout by spectrophotometer that will confirm or deny the presence of disease in the samples.

To be useful in a packing plant, a disease detection system must be stable and environmentally acceptable. (The ELA test uses no radioactive isotopes or dangerous reagents; thus, it meets these conditions.) Such a system must be fast enough -- about 20 to 30 minutes--to ensure that individual animal identities are not lost, and, perhaps most important, it must be economical and capable of keeping up with a packing house slaughter rate as high as 950 animals per hour. Saunders believes the ELA test can meet these requirements.

Automated equipment is being commercially fabricated to LASL criteria and should be installed and calibrated this spring. Saunders indicates it will have an initial capability of screening 240 samples

per hour, with an ultimate capability of more than 480 samples per hour.

"The automated system will be tested in a packing house later this year," he explains. "It should generate sufficient data from a large number of animals to determine the value of using one or more on-line systems as an adjunct to the meat inspection program. We believe it will do so at a cost of just pennies per sample."

The ELA concept should work for any disease of man or animals in which a suitable antigen can be bound to a surface and in which antibodies are produced against that disease agent. Conversely, according to Saunders, binding appropriate antibodies to surfaces should have wide application in the detection of various antigenic materials, such as cancer or hepatitis antigens. Saunders calls this reverse ELA procedure a "sandwich technique."

Antibodies, produced in test animals, would be bound to trays, then incubated with samples of suspect material that might contain antigens. If antigens are present, they will bind to the antibodies. A second antibody with an enzyme tag identical to that originally bound to the tray is then added. Finally, a developer chemical is added to indicate, by a color change, whether the sample is positive or negative. This sandwich technique was employed in ELA testing for staphylococcus enterotoxin.

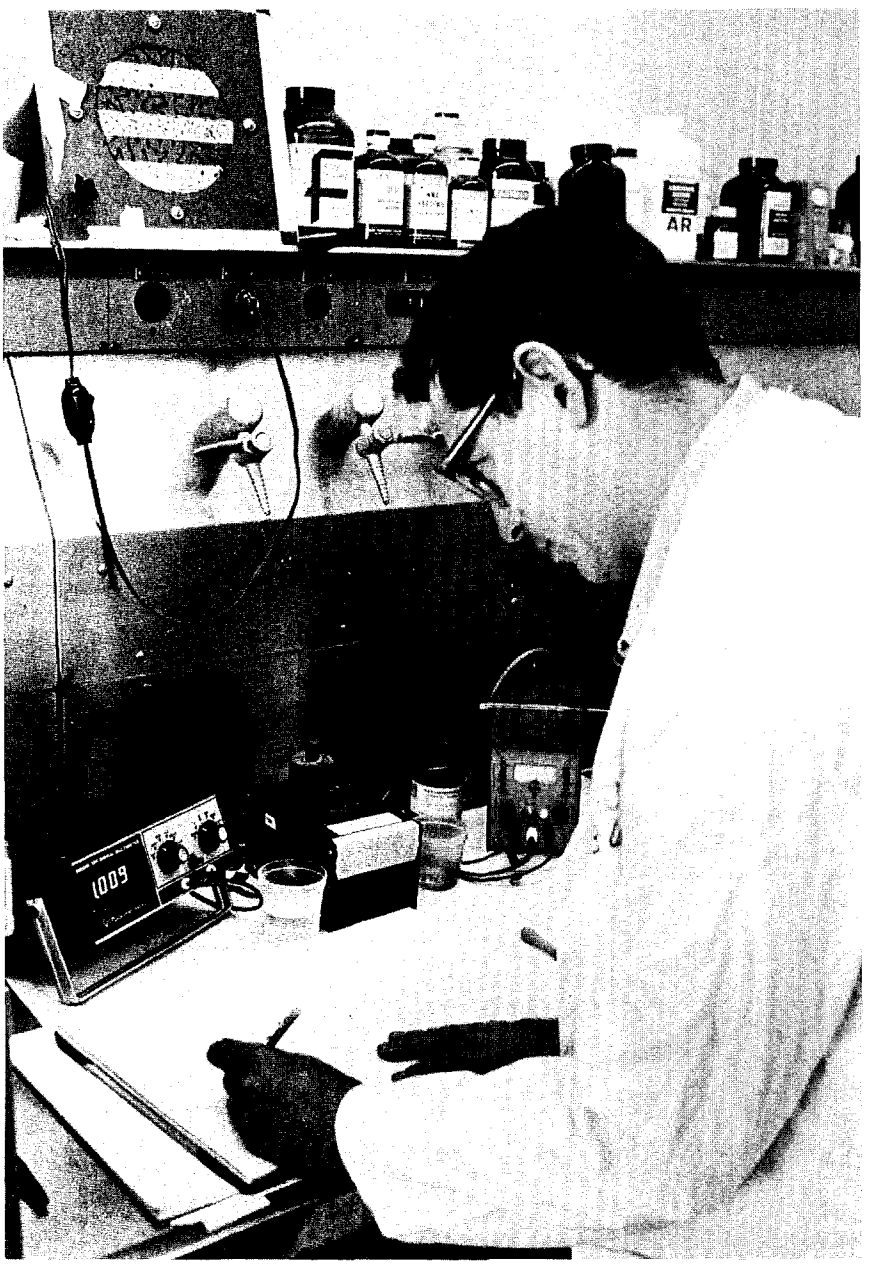
It has taken a long time for researchers at LASL to perfect a disease detection system that is apparently economical, versatile, and readily adaptable for commercial use, but perhaps the best is yet to come.

Saunders says H-6 scientists will continue using enzyme-labeled antibody tests to look at many more diseases of man (including cancer) and animals.

"There is also real potential here for screening for pollutant," Saunders believes. For example, PVC (polyvinyl chloride used in plastics and linked to human cancer) may be detectable with an ELA test.

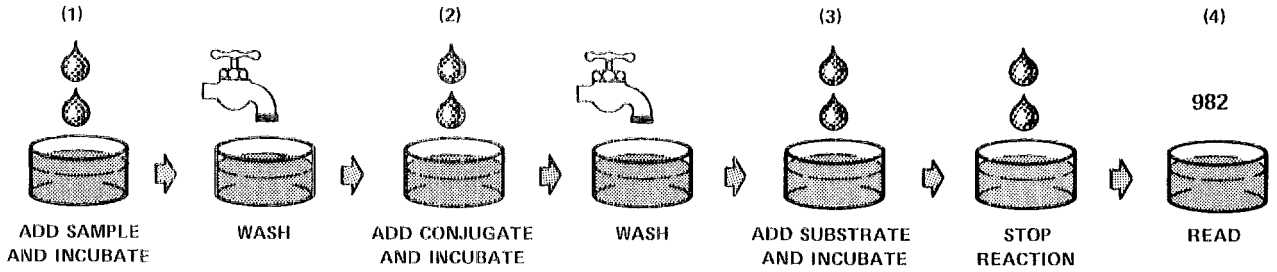
H-6 researchers believe ELA may become the test of choice in many areas of research. Developed for both health and economic reasons, it may become one of an increasing array of early warning systems of the kind that mankind has prized over the years as the human race has struggled for survival. Early warning systems prove the truism: Forewarned is forearmed.

Saunders records the digital reading of the spectrophotometer after samples of serum were tested.



THE ELA TEST

THE ENZYME-LABELED ANTIBODY (ELA) TEST WAS DEVELOPED TO DETECT DISEASE BY OBSERVING THE PRESENCE OF THEIR ANTIBODIES IN BLOOD. THE METHOD IS SENSITIVE, FAST, INEXPENSIVE, AND SUITABLE FOR DETECTING MANY DIFFERENT DISEASES IN HUMANS AND ANIMALS. THE TEST IS ILLUSTRATED BELOW FOR ONE DISEASE.

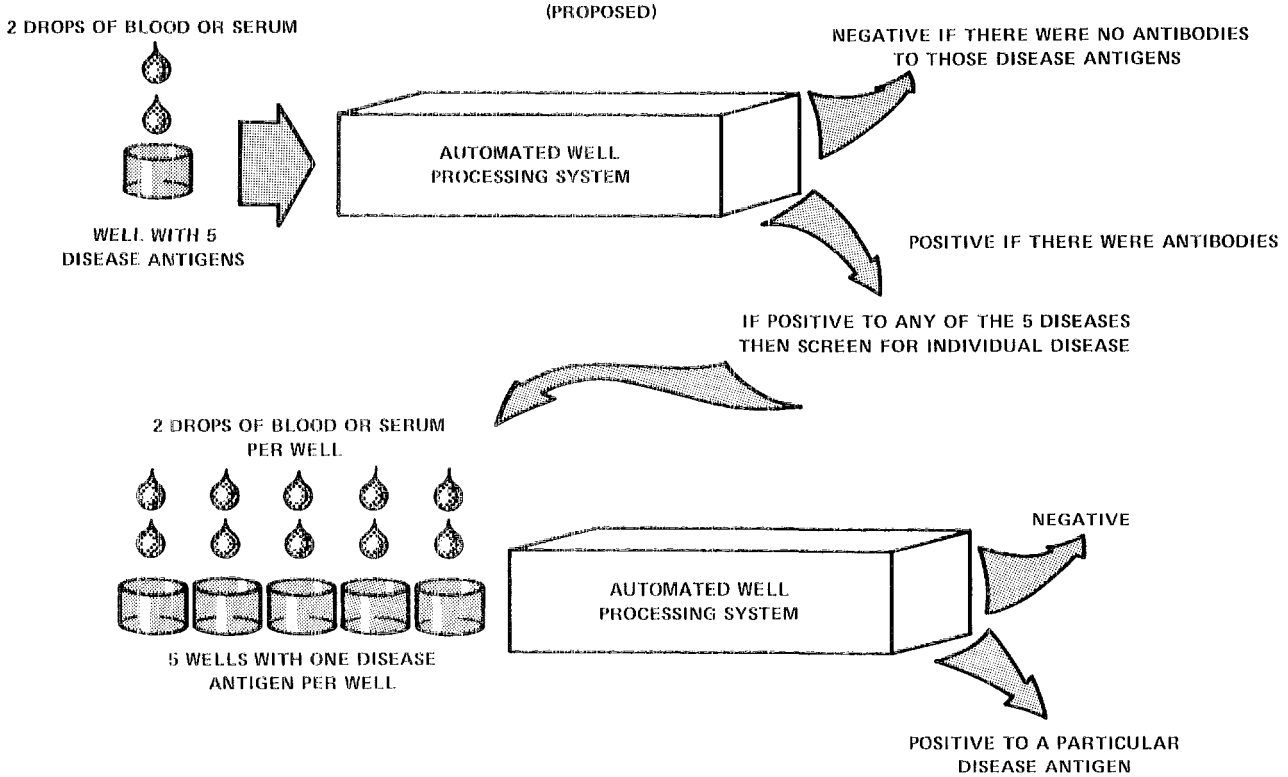


1. TWO DROPS OF BLOOD OR SERUM ARE ADDED TO AN ANTIGEN-COATED MICROTITER WELL.
2. THE CONJUGATE IS A MATERIAL THAT WILL ADHERE TO AN ANTIGEN-ANTIBODY COMPLEX AND HAS "TAG" OF AN ENZYME ASSOCIATED WITH IT.
3. THE SUBSTRATE IS A MATERIAL THAT UNDERGOES A COLOR CHANGE IN THE PRESENCE OF THE ENZYME.
4. NEGATIVE = CLEAREST LIQUID
   POSITIVE = DARKER LIQUID

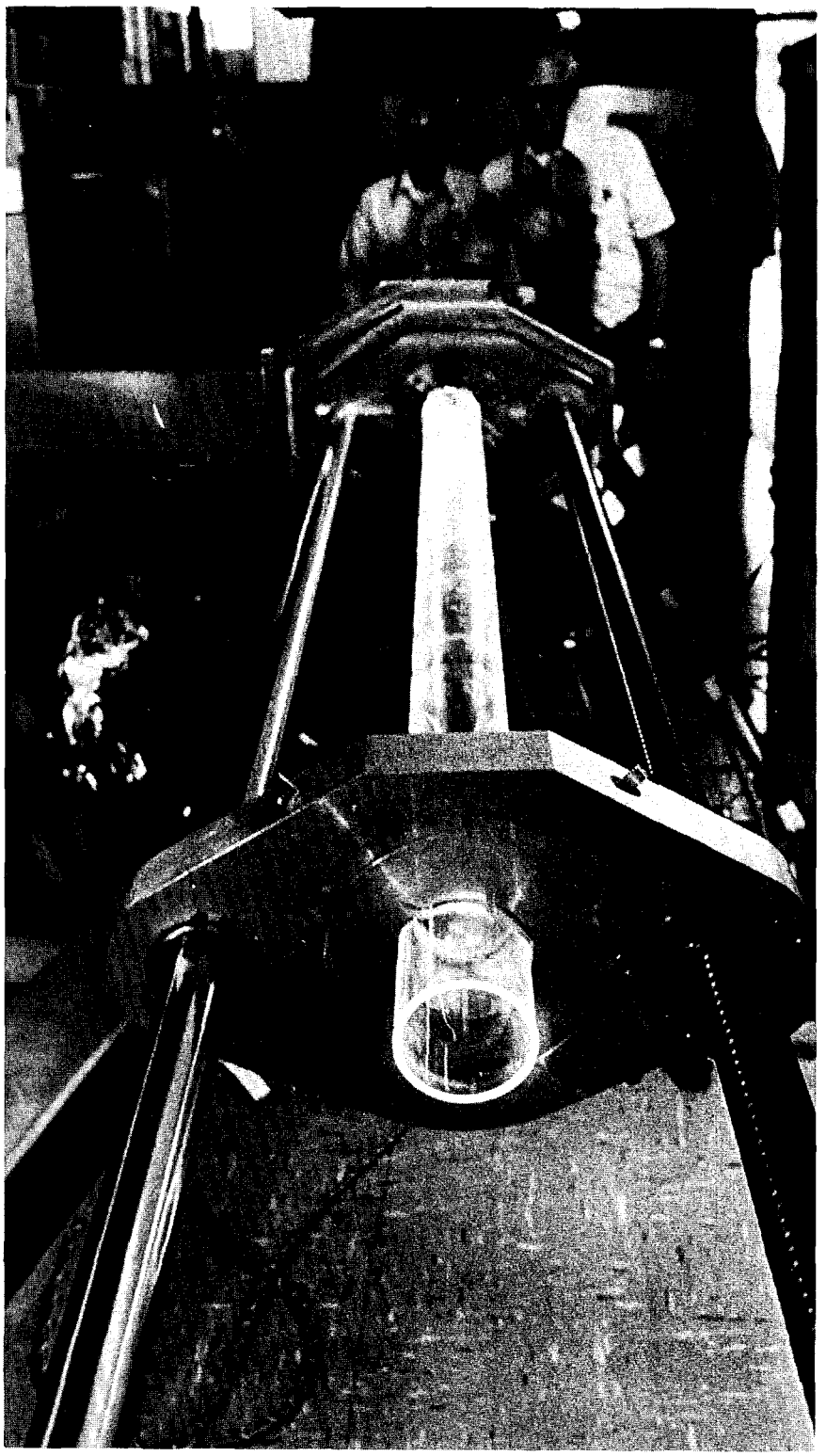
THE PROCESSING CAN BE DONE IN LESS THAN 30 MINUTES AT A COST OF A FEW CENTS PER TEST. ONLY MINOR CHANGES IN REAGENTS OR CONDITIONS ARE REQUIRED FOR DIFFERENT DISEASES OR DIFFERENT SPECIES. AUTOMATION OF THE PROCESSING IS UNDERWAY.

EXPERIMENTS INDICATE THAT THE ELA CAN BE ADAPTED TO SCREENING FOR ANTIBODIES FOR MORE THAN ONE DISEASE. THE CONCEPT IS ILLUSTRATED BELOW.

LASL MULTIPLE DISEASE SCREENING SYSTEM
(PROPOSED)



Quartz-Forming Machine Unique



It Forms Helical, Toroidal Tubes

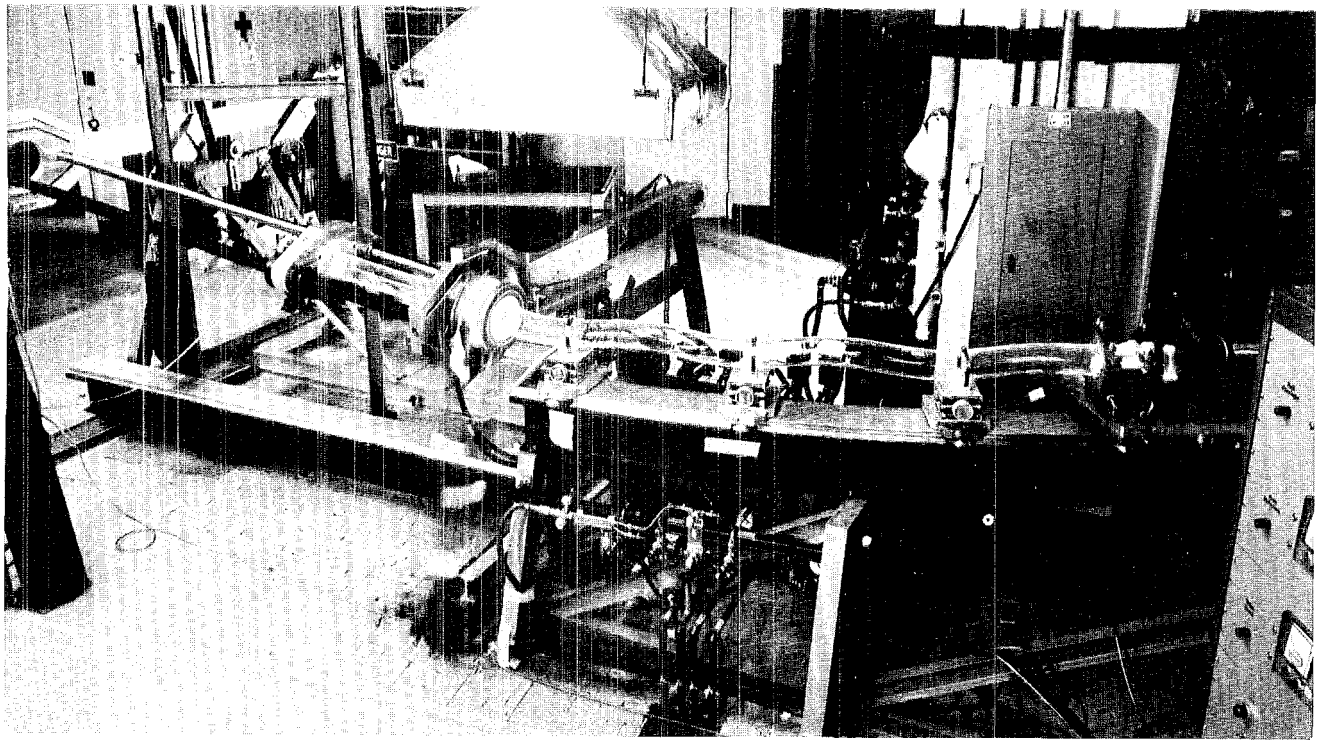
Scientists working in LASL's magnetic fusion energy research program needed a helical, toroidal fused-quartz tube with a 10-centimeter outside diameter to use as the vacuum vessel in the Scyllac plasma research machine.

Obtaining straight, cylindrical tubes of fused quartz was not a serious problem, but forming the geometry of Scyllac was a very difficult problem.

Until 1974, Scyllac had been using simple 10-centimeter-diameter toroidal tubes in their experiments. The requirement for a toroidal tube with a helical geometry became apparent in order to enhance the confinement of the plasma column.

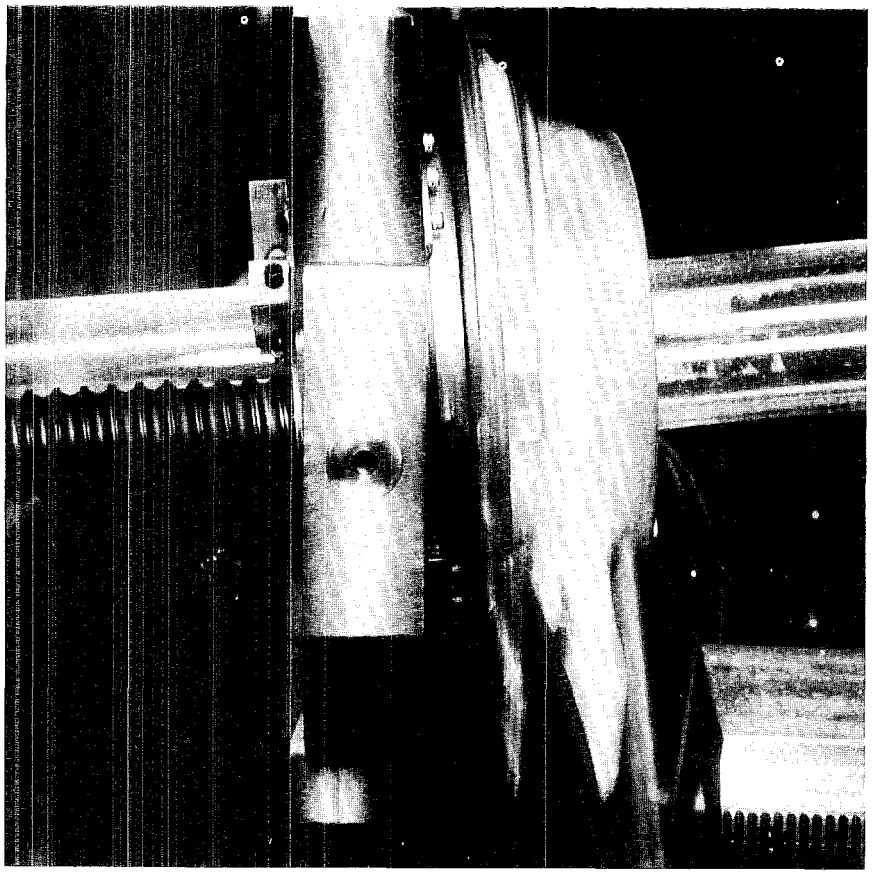
LASL researchers went to the Max Planck Institute for Plasma Physics in Garching, West Germany, to appraise their toroidal helix quartz-forming machine. The basic West German design would work, but it was felt that the design needed more flexibility.

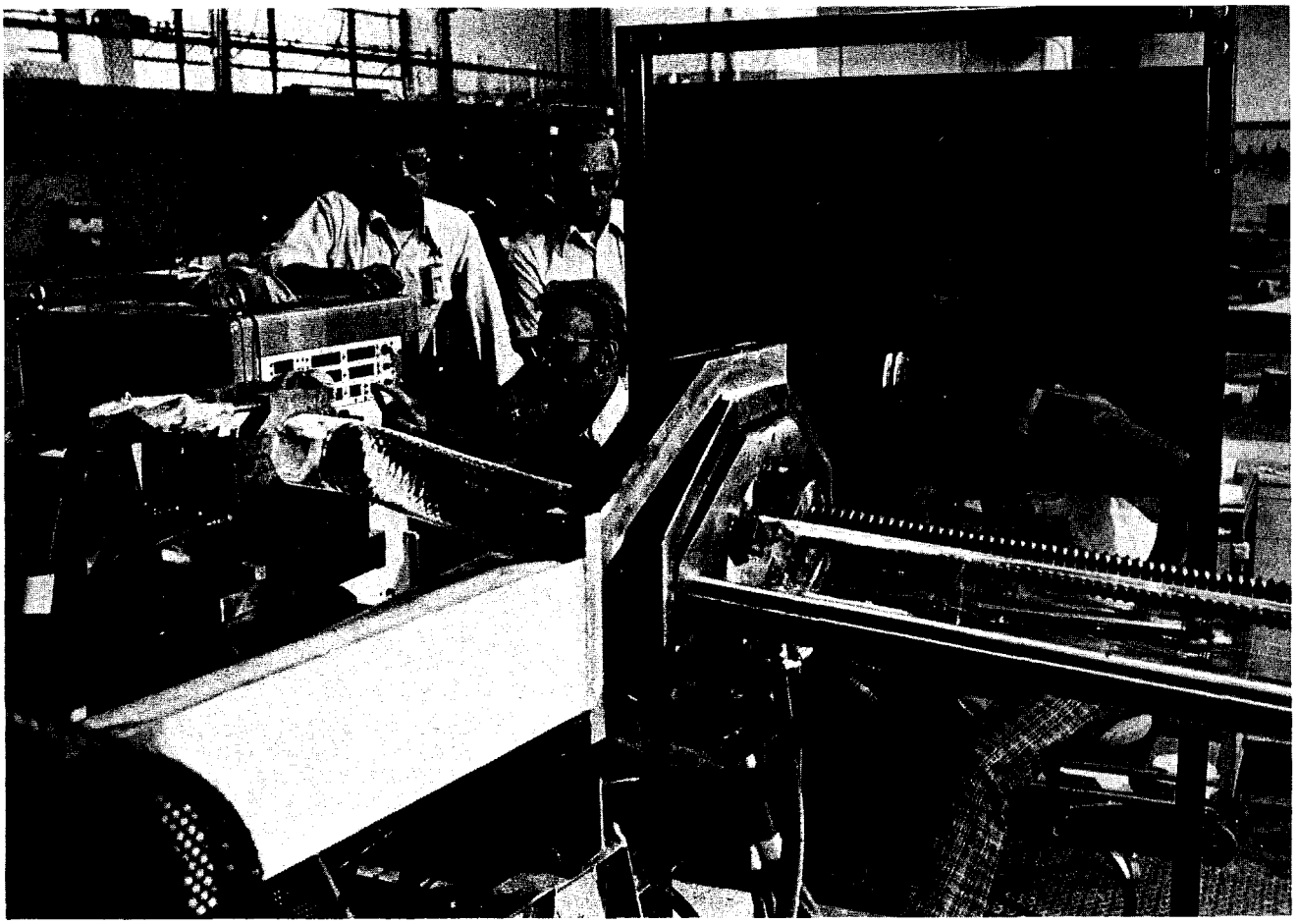
Ken Hanks, left, and Ted Cole, both CTR-4, observe a straight quartz tube being fed into burner, in front of them, that heats the tube to a soft state while being formed into a helical, toroidal shape.



A view of the entire quartz-forming machine and control panel.

This close-up photo shows the burner section of the machine, with straight tube being fed into it from the left, and formed tube exiting it at the right.





Hanks, standing left, Cole, center, and Paul Thomas, SD-DO, standing right, watch Ervin Kiemle, CTR-3, operate controls for the electric stepping motors which drive each of the 3 moving portions of the machine. Lou Schlatterer, SD-DO, sitting behind screen, observes the operation, which is at the start of a run.

The alternative, LASL engineers realized, was to design and build at LASL a quartz-forming machine capable of producing the tubes required, and after more than a year and a half of design and construction work, LASL in 1976 built the only quartz-forming machine of its kind.

The machine allows the forming of large fused-quartz tubes with diameters of 5 to 20 centimeters to a helical, toroidal shape.

The burden of making a machine to produce fused-quartz tubes for Scyllac, a project of the CTR Division, went to CTR-4, the engineering group. Ken Hanks and Ted Cole were responsible for the design and engineering work. Ervin Kiemle, CTR-3, was responsible for assembling the machine and checking it out with expert assistance from personnel in the glass shop of the Shop Department.

The device is a combination of (1) two universal joints mounted on support arms rotated concurrently about the helical axis, each with a different radius. This action rotates, in a cone-shaped movement, the section of straight quartz tube being fed into a burner positioned near the apex of the cone. (2) A toroidal track to pull the helix into a toroid as it is pulled from the burner.

The machine essentially is doing

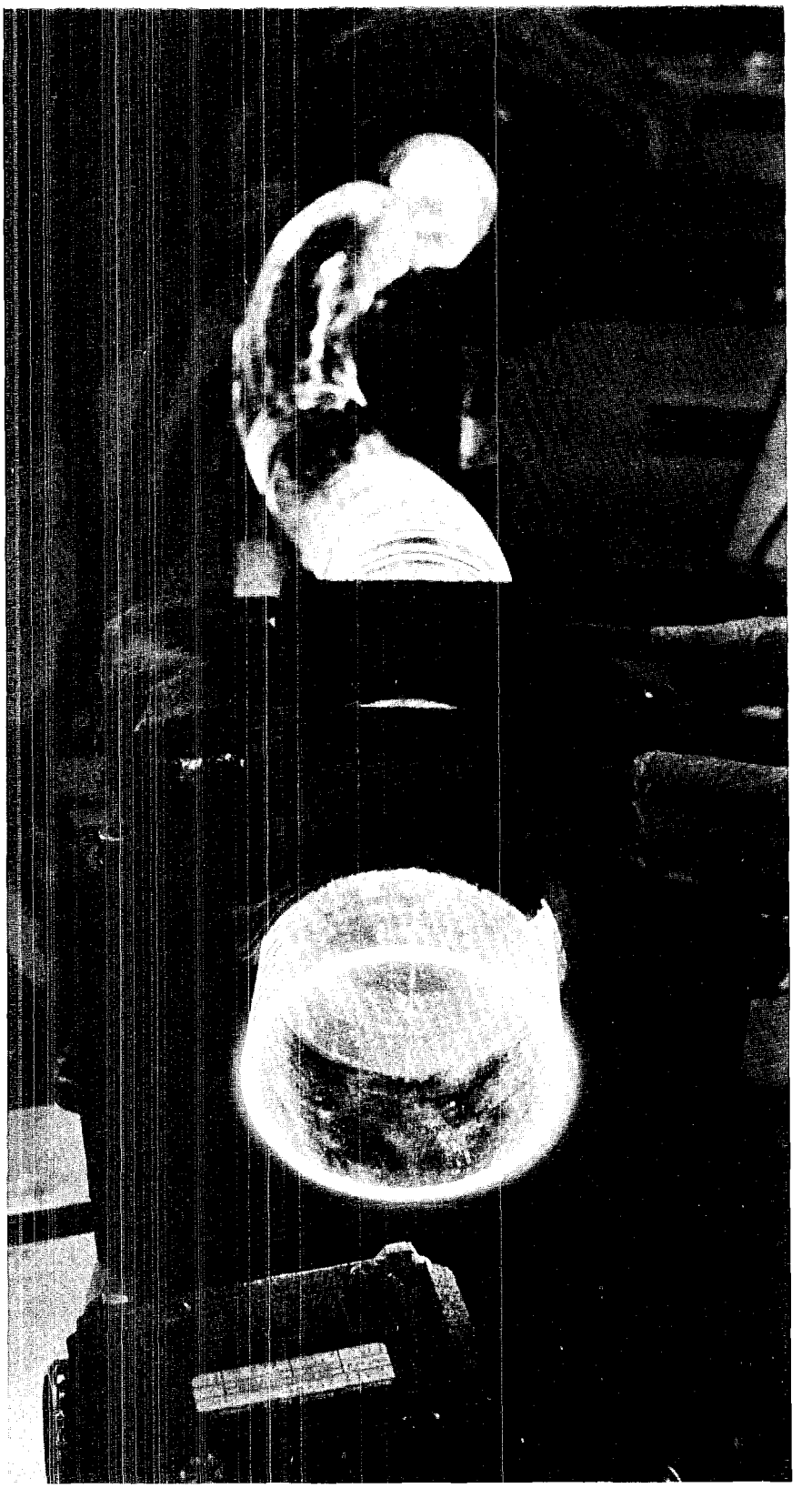
3 things. It is moving a cylindrical straight quartz tube along its length; it is creating a precise angular bend in the tube; and it is applying a carefully controlled temperature to a narrow defined area so that the applied bending can be translated into a shaping increment before hardening takes place. The result is a toroidal helix.

Fused quartz has a relatively high softening temperature (1750° C) and a narrow temperature working range. It is these properties that allows the forming of fused quartz into desirable highly complicated shapes.

The Machine Wasn't Available, So LASL Built It's Own

The straight quartz tube is pushed into the burner. The formed helical tube is pulled from the burner along a horizontal toroidal track while being held by moving supports that keep the track centerline and the toroidal geometry in alignment. Electric stepping motors are used to drive the pull carriage, tube carriage and rotating arms.

The burner is mounted 13 centimeters in front of the front universal and is rotated about its own axis through an arc of approximately 20 degrees so that a uniformly heated hot zone is achieved. The burner contains 72 ports equally



View of the newly formed helical tube as the last part of the straight tube is pulled through the burner.

spaced on a circle 2 centimeters larger in diameter than the quartz tube outside diameter, and it is tilted 15 degrees toward the front universal so that some pre-heating of the tube occurs.

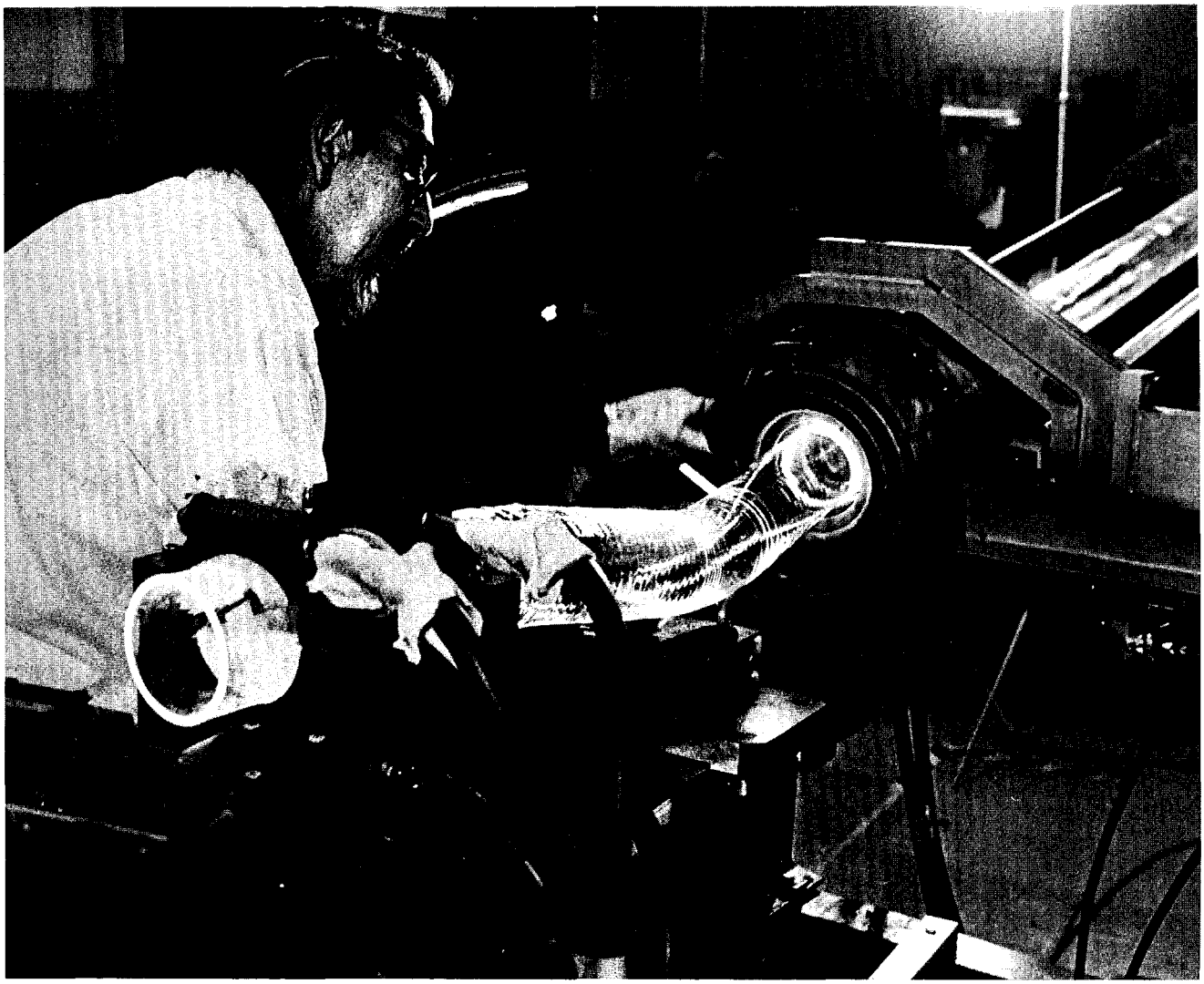
This burner configuration, with a hydrogen-oxygen flame, results in a soft zone on the tube about 2 millimeters wide.

The tube produced has an outside diameter of 10 centimeters and a wall of 5 millimeters. The helical radius is 3.16 centimeters, and the tube has a 4-meter toroidal radius pulled through 2½ turns, or wavelengths. Each helical wavelength requires 75 minutes to produce and is one full revolution of the universal support arms.

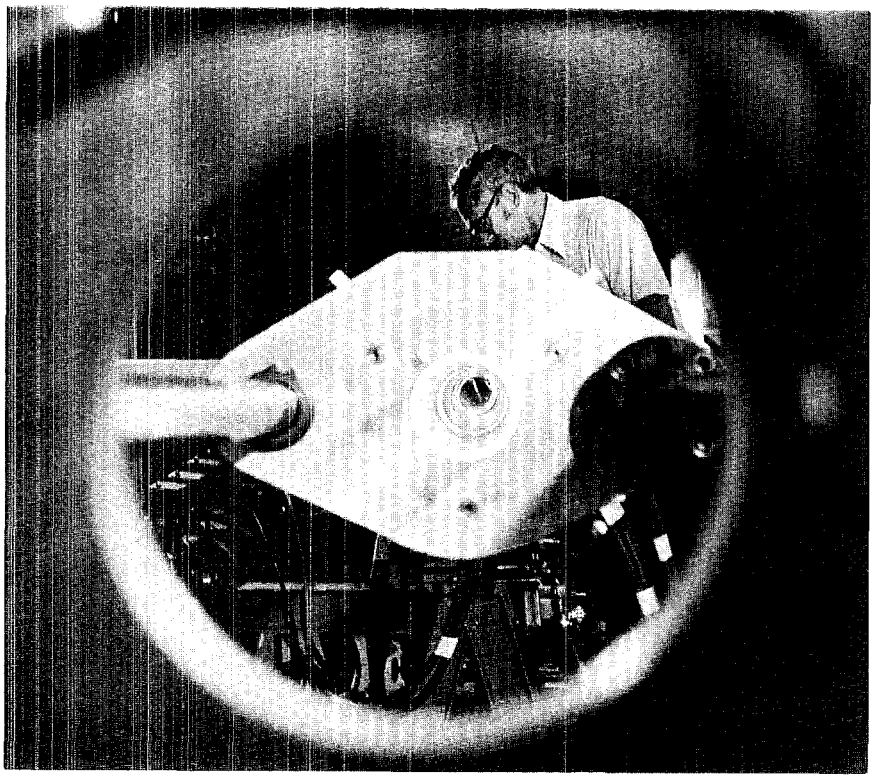
The Scyllac design, for technical reasons, requires a transparent plasma chamber with the purity of fused quartz and the form of a toroidal helix to produce and confine a toroidal ring of plasma (an ionized gas produced by thermonuclear temperatures). The plasma, which is a good electrical conductor, is produced in a quartz tube inside a one-turn magnet coil. The magnet coil is energized by a 4-story-high capacitor bank around its periphery which stores 10 megajoules of energy when fully charged.

The quartz-forming machine, in making the unique, precise fused-quartz tube for Scyllac's confinement experiments, is playing its part in furthering optimistic research into magnetic fusion energy development.

Schlatterer installs a support clamp under the newly formed tube as it begins its movement along the toroidal track.



In the photo at right, Cole is seen through the hole in the universal as the tube is advancing through the burner. The photo at bottom illustrates the tube's clarity, which is a requirement for the plasma to be photographed.



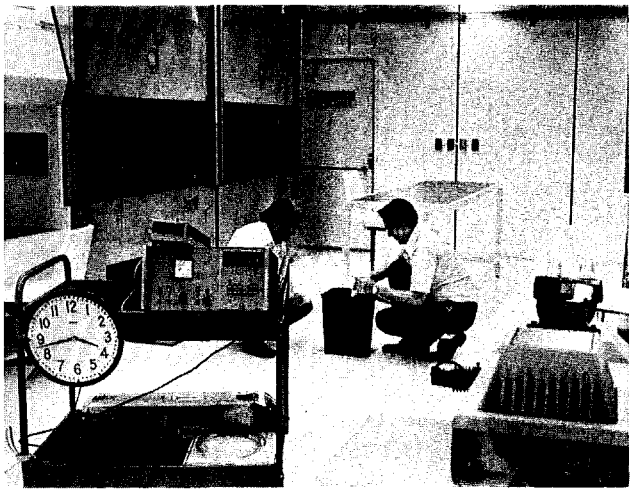
This Clean Room Really Is Clean, And Stays That Way

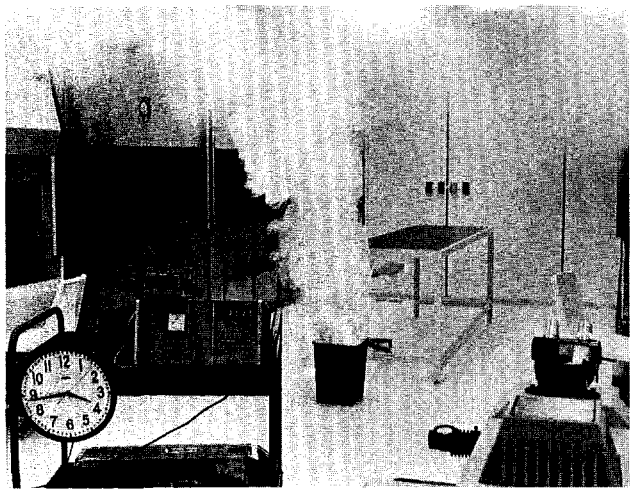
An exceptionally "clean" room is mandatory when silicon wafer detectors and delicate electronic instrument parts are being worked on or fabricated.

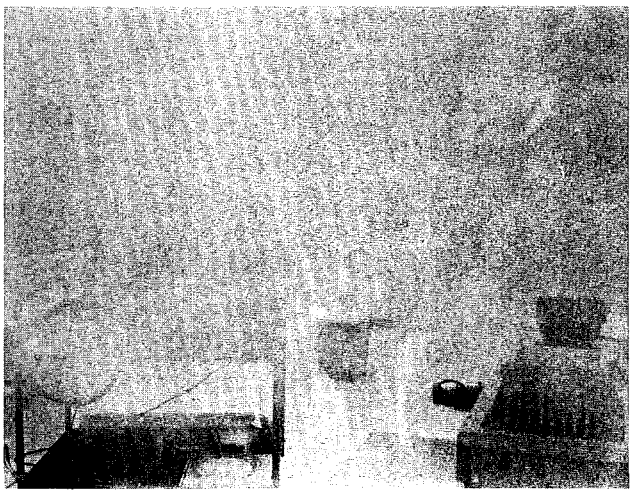
Clean means not only that the floor and cabinet surfaces must be clean, but the air must be as nearly pure as possible to prevent particles from getting into and affecting performance of the electronic device. In order to achieve this degree of purity, there must be a special room where no more than 100 particles per cubic foot of air are present. A cubic foot of air in a typical office might have as many as 1 million particles per cubic foot.

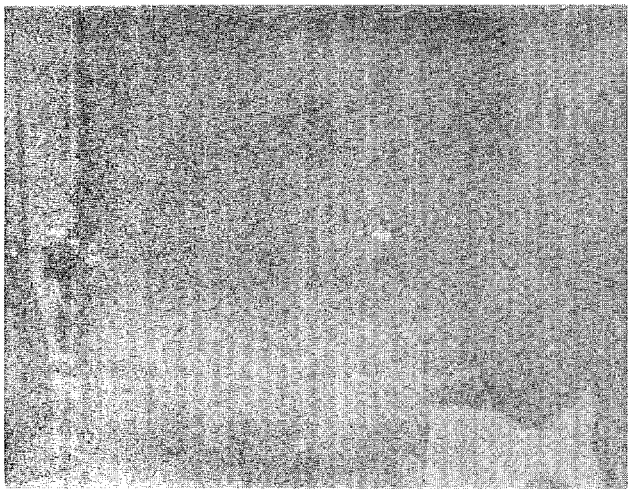
E-Division has designed such a room, and the photos on this and the following page illustrate an air circulation system that rapidly cleans, and keeps clean, the air in the room.

Used in the room, built by the Zia Co., is a HEPA filtering system through which the total volume of air in the room passes 10 times per minute. A particle counter in the room counts all particles 0.5 micrometer and larger.

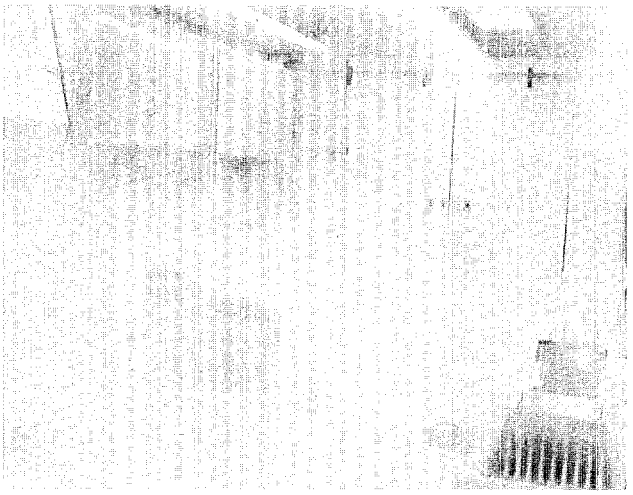


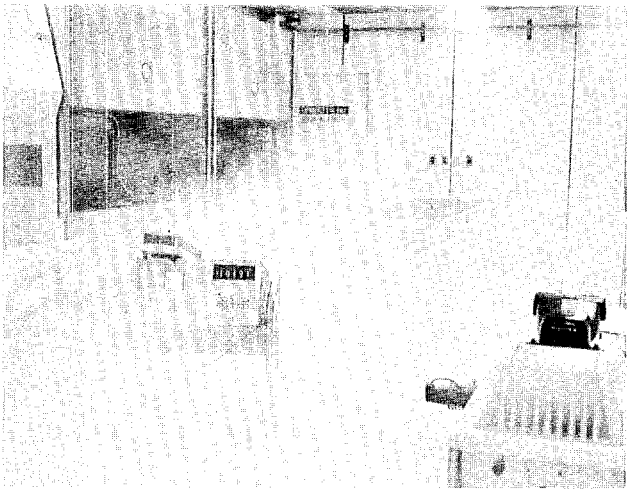




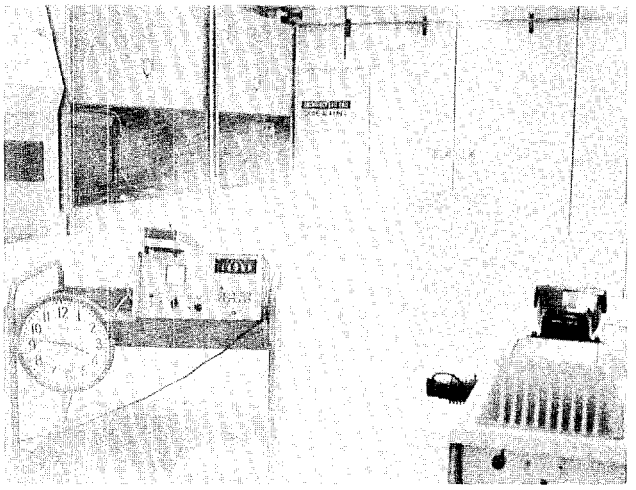


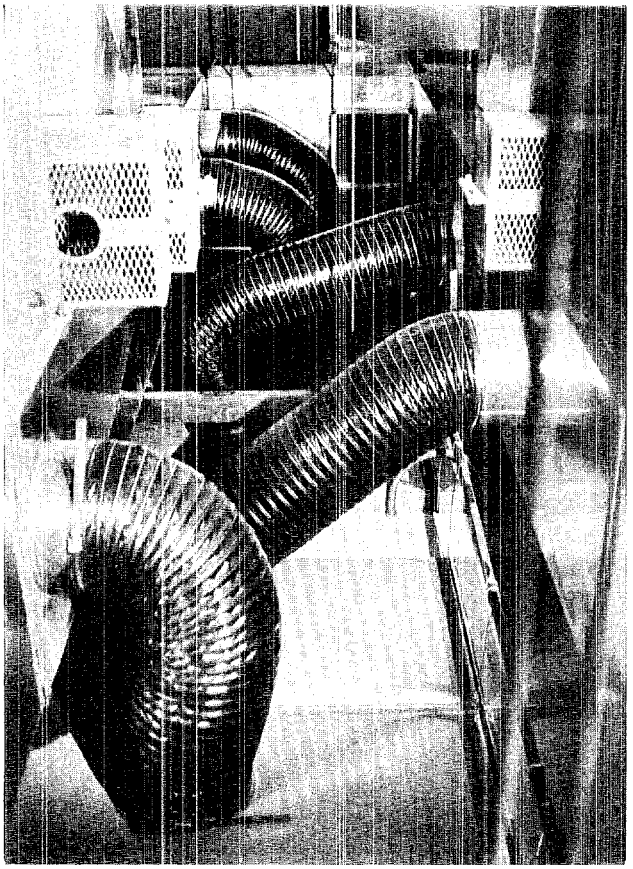
In the top left photo, Chuck Derouin, E-DO, left, and Austin Mee, project engineer with Compaire Systems, Inc., an environmental air control systems company, ignite a smoke bomb, which, in the top right photo, begins to emit smoke. In the bottom two photographs, the E-Division clean room is filled with smoke.

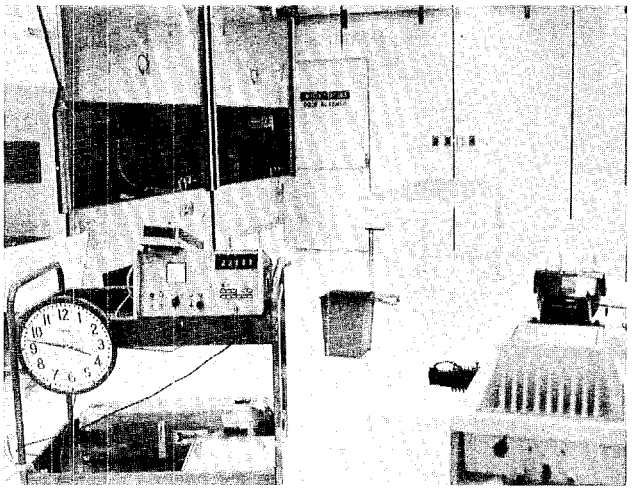




After the filtering system has been activated, the smoke in the top 2 photos begins to disappear. In the photo at right, most of the smoke has been removed by the filters, mounted in the ceiling, and in the bottom right photo, the room is nearly as particle-free as before the smoke bomb was ignited. In less than 5 minutes, the air in the room was cleaned and made acceptable for processing electronic devices.







The photo at left shows parts of the filtering system, mounted above the clean room, which circulates and displaces air in the room 10 times per minute, and maintains positive pressure for maximum cleanliness.

short subjects

Retirements: **William J. Wynne,** SD-5, development machinist; **Marjorie R. Rector,** DIR, executive secretary; **Joseph J. Vucenic,** SD-5, laboratory machinist; **Phil B. Porter,** J-8, staff member.

Deaths: **Dorothy Barylski,** AADP-1, EDP operator.

Thomas P. Pike, chairman of the National Council of Alcoholism, spoke on "The Alcoholic Executive" at a colloquium at the Laboratory on January 11. Pike described his many years as an alcoholic before being cured, and said alcoholism, in his opinion, is a disease.

Graydon A. Thayer was appointed Personnel Department head and assumed his duties January 3. He came to LASL from Tyco Laboratories, Waltham, Mass., where he was director of corporate personnel.

A new technical division, the Geosciences (G) Division, has been formed at the Laboratory and became effective February 1. In a related move, R-Division was dissolved, and its personnel and functions transferred to Q-Division. **Robert Brownlee** heads the new G-Division, and **Allen G. Blair** is alternate G-Division leader. **William G. Davey** becomes head of Q-Division and **Kaye D. Lathrop** is alternate Q-Division leader.

10 years ago in los alamos

Culled from the February, 1967 Files
of The Atom and The Los Alamos Monitor, by Robert Y. Porton

State Officials Visit

Radiation safety, pollution safeguards and research into new sources of nuclear energy were some of the topics of discussion highlighting a visit to Los Alamos by members of the New Mexico State Legislature. Interrupting their heavy work schedule the legislators and their wives made the trip. They were guests of the Chamber of Commerce for lunch and then toured LASL's health and thermonuclear fusion research areas and the Science Hall. At the luncheon, Dr. Norris E. Bradbury, Laboratory Director, reviewed the history of the Laboratory and spoke of promising programs of the future.

LASL Men Make TV Film

High flying solar eclipse experimenters from the Los Alamos Scientific Laboratory will be featured on a National Educational Television color program, "The Living Sun," which will be released this month. Narration of the film is by Arthur N. Cox, J-15. Also appearing in speaking roles are Robert Brownlee, J-15; Paul Rudnick, J-16; and Donald Liebenberg, CMF-9. A spectacularly beautiful sequence of the eclipsed sun and its corona, location footage in Argentina, and in-flight action of scientific crew members at work aboard the NC-135 flying laboratory, were all photographed by LASL's John McCloud, D-10, whose official documentary footage was made available to NET.

"Oppie" Dies

Dr. J. Robert Oppenheimer, the founder of the Los Alamos Scientific Laboratory, died Saturday at his home in New Jersey. Dr. Oppenheimer was LASL's first director, holding the post from its establishment in 1943 until October, 1945 when Dr. Norris E. Bradbury succeeded him. It was Oppenheimer who brought together the diverse talents necessary to develop the first nuclear explosives. He cajoled some of the world's greatest scientific minds into submerging themselves in the development of an atomic bomb. He left the Laboratory to become head of Princeton University's Institute of Advanced Studies, a post he held until 1965. Dr. Oppenheimer last visited Los Alamos in May, 1964. He was warmly greeted by a capacity crowd when he spoke at the Civic Auditorium.

Di Luzio Named Assistant Director

Frank C. Di Luzio has been named assistant director for governmental and university relations at the Los Alamos Scientific Laboratory, effective February 1.

The appointment was announced by Director Harold Agnew. Di Luzio has been assistant for planning to the Director since joining the Laboratory on March 3, 1975.

Di Luzio's duties will include advising the Director's Office and senior LASL staff on governmental and university matters and coordinating these activities as required. He will be the focal point at LASL for maintaining liaison with state and national congressional committees and individual congressmen on matters of concern to the Laboratory, and he will advise the LASL staff on the views of government entities. In addition, he will coordinate the provision of information on Laboratory programs to the regional universities and state and national bodies.

"I am extremely pleased that Mr. Di Luzio has accepted this new position," Agnew said. "His experience in government work will be a valuable asset. His past 2 years as my assistant for planning have shown that he has the capability and expertise needed in this job."

Before coming to LASL Di Luzio was science advisor and administrative assistant to New Mexico Gov. Bruce King. Before that he was special assistant to U.S. Senator Clinton P. Anderson of New Mexico. As a special assistant he concentrated on space matters, atomic energy, water, energy, and natural resource problems.

In April 1963, Di Luzio became executive director of the U.S. Senate Aeronautical and Space Science Committee, where he remained until January, 1965. He later became director of the Office of Saline Water in the Department of Interior, and from August, 1966, to December, 1967, was Assistant Secretary of the Interior for water pollution control.

He was area manager of the U.S. Atomic Energy Commission's Los Alamos office from 1952 to 1956 and deputy manager of the AEC's Albuquerque Operations Office from 1956 to 1961.

From December, 1967, to June, 1969, Di Luzio served as vice president of EG&G, an electronics research and development firm, and president of Reynolds Electronics and Engineering, Las Vegas, Nev.

Di Luzio has served as consultant to the National Aeronautics and Space Administration, the U.S. Department of Interior, and several U.S. Senate committees on energy, environment, natural resources, and space. He is also a member of the National Science Foundation advisory committee for research applications policy and an advisory member to the Pan American Medical Association.

Garwin Appointed LASL Fellow

Richard L. Garwin, an internationally recognized physicist, has agreed to become a Fellow of the Los Alamos Scientific Laboratory.

Garwin's appointment was announced by Director Harold Agnew. He joins 4 other scientists as LASL Fellows: Herbert L. Anderson, professor of physics at the University of Chicago; Bernd T. Matthias, professor of physics at the University of California, San Diego (UCSD) and director of the Institute for Pure and Applied Physics at UCSD; Gian-Carlo Rota, professor of applied mathematics and philosophy at the Massachusetts Institute of Technology; and Anthony Turkevich, professor of chemistry at the Enrico Fermi Institute, University of Chicago.

The position of Fellow can be held for an unspecified period of time and is awarded to outstanding scientists. As a Fellow, Garwin will spend time at LASL pursuing research activities of his choice.

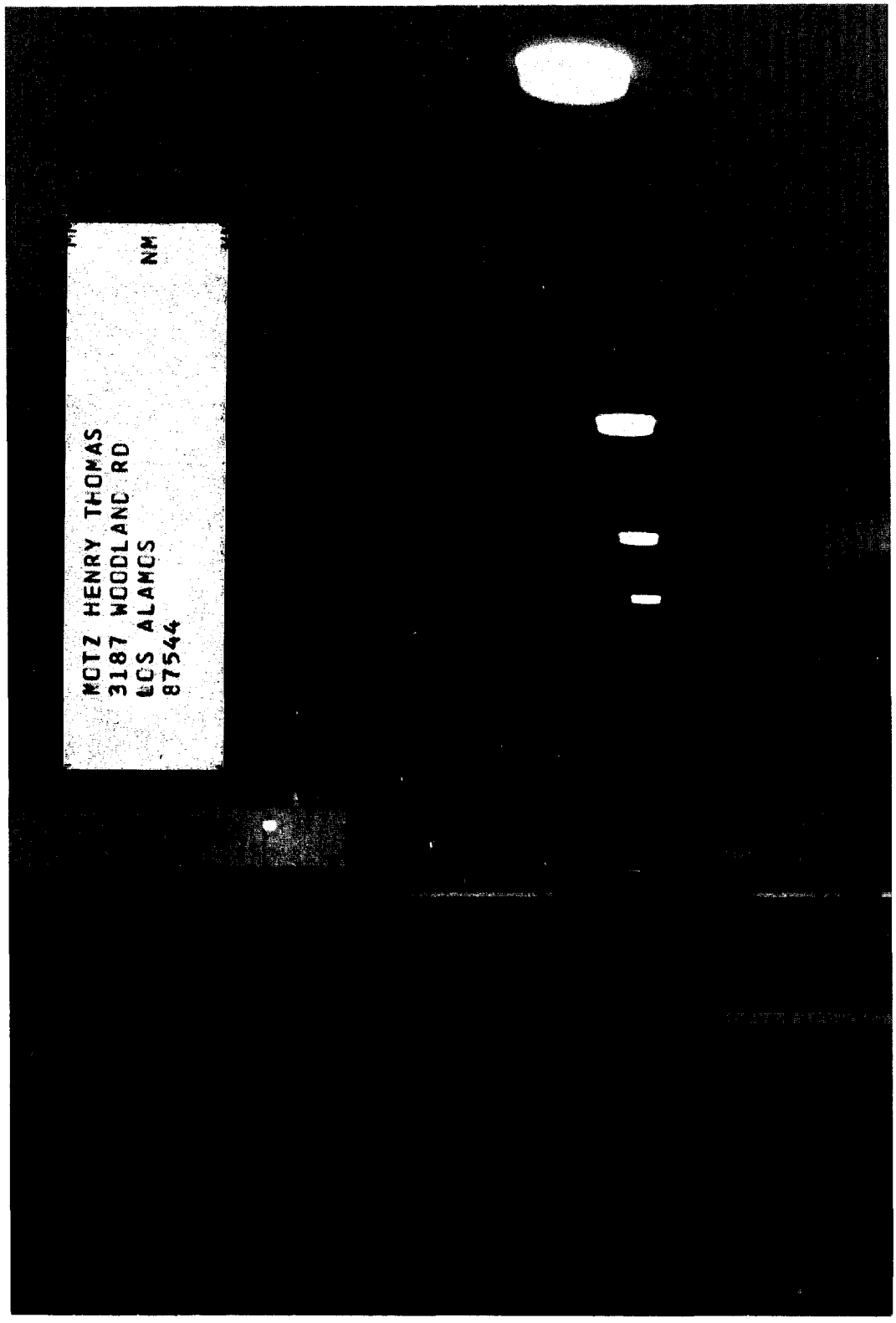
A consultant to LASL since 1949, Garwin is presently a Fellow of the IBM Corporation's Thomas J. Watson Research Center, where he served formerly as director of applied research.

Areas of research in which Garwin has made significant contributions include general physics, liquid and solid helium, general electronics, avionics, and national defense.

Garwin was born in Cleveland, Ohio, on April 19, 1928, and was educated at Case Western Reserve University, where he received his B.S. degree in 1947 and D.Sc. degree in 1966, and at the University of Chicago as a student of Enrico Fermi, where he received his M.S. in 1948 and Ph.D. in physics in 1949.

He was employed at the University of Chicago as an instructor and assistant professor of physics until 1952, when he took a position as a physicist with the IBM Corporation's Watson Laboratory.

Garwin's daughter, L a u r a, headed the list of women selected as Rhodes Scholars this year—the first in which women were eligible.



Did 4 well-illuminated flying objects hover over Los Alamos recently? If they did, they certainly weren't reported, and apparently only Bill Jack Rodgers managed to photograph them. So, if you have doubts, turn to the inside front cover of The Atom.